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Data Summary Report IHSS Group 900-4&5



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Data Summary Report
IHSS Group 900-4&5

Approval letter received from the Colorado Department of Public Health and Environment

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Approval letter contained in the Administrative Record

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APPENDIX

Appendix A	IHSS Group 900-4&5 Wildlife Refuge Worker/Ecological Receptor Action Level Comparison Table
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ENCLOSURE

Real and QC Data (compact disc)

ACRONYMS AND ABBREVIATIONS

AL	action level
AR	Administrative Record
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DL	Detection Limit
DOE	U.S. Department of Energy
DQA	Data Quality Assessment
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
HRR	Historical Release Report
IA	Industrial Area
IASAP	Industrial Area Sampling and Analysis Plan
IHSS	Individual Hazardous Substance Site
K-H	Kaiser-Hill Company L.L.C.
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
DL	detection limit
mg/kg	milligram per kilogram
NA	not available
ND	not detected
NFAA	No Further Accelerated Action
PAC	Potential Area of Concern
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
pCi/g	picocurie per gram
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RIN	report identification number
RL	reporting limit
SAP	Sampling and Analysis Plan
SD	standard deviation
SOR	sum of ratio
SSRS	Subsurface Soil Risk Screen
SVOC	semi-volatile organic compound
SWS	Surface Water Standard
µg/kg	microgram per kilogram
VOC	volatile organic compound
V&V	verification and validation
WRW	Wildlife Refuge Worker

1.0 INTRODUCTION

This Data Summary Report summarizes characterization activities conducted at Individual Hazardous Substance Site (IHSS) Group 900-4&5 at the Rocky Flats Environmental Technology Site (RFETS) in Golden, Colorado. Characterization activities were planned and executed in accordance with the Industrial Area Sampling and Analysis Plan (IASAP) (DOE 2001) and IASAP Addendum #IA-02-02 (DOE 2002a).

IHSS Group 900-4&5 consists of Potential Area of Concern (PAC) 900-175, S&W Building 980 Contractor Storage Facility and PAC 900-1308, Gasoline Spill Outside of Building 980. PAC 900-1308 received a No Further Action (NFA) determination on February 14, 2002 and consequently is not included in this report. The location of PAC 900-175 is shown on Figure 1.

2.0 SITE CHARACTERIZATION

IHSS Group 900-4&5 information consists of historical knowledge (DOE 1992-2001), previous sampling data from nine sampling locations (DOE 2002a), and six additional surface soil sampling locations with specifications as described in IASAP Addendum #IA-02-02 (DOE 2002a). The sampling specifications from IASAP Addendum #IA-02-02 are listed in Table 1. The location of these samples and analytical results greater than background mean plus two standard deviations or reporting/detection limits are presented in Figure 2 and Table 2. A summary of the analytical results is presented in Table 3. Deviations from planned sampling specifications are presented in Table 4. Validated analytical records are presented in Tables 5 through 12. The real and quality control (QC) data are enclosed on a compact disc.

Analytical results from the previous and the most recent sampling events indicate that all contaminant concentrations are less than RFCA Tier II and Wildlife Refuge Worker (WRW) action levels (ALs). Lead is the only contaminant that exceeds the Ecological Receptor AL; however, all of these results are below the background level. A comparison of the most recent analytical results above background mean plus two standard deviations or detection/reporting limits to the WRW and Ecological Receptor ALs is presented in Appendix A.

Analytical results indicated that No Further Accelerated Action (NFAA) for IHSS Group 900-4&5 is warranted for the following reasons:

- All contaminant concentrations are less than WRW ALs.
- All contaminant concentrations are less than Ecological Receptor ALs except for lead. However, all lead results are below the background level of 54.62 mg/kg. The Ecological Receptor AL for lead is 25.6 mg/kg.
- Based on the analytical results and the distance to the near surface water body, this IHSS Group does not appear to have adversely impacted surface water.

Based on historical knowledge and previous sampling data, subsurface soil sampling was deemed unnecessary and was not evaluated per IASAP Addendum IA#-02-02 (DOE 2002a). Consequently, a Subsurface Soil Risk Screen (SSRS) is not required.

Approval of this Data Summary Report constitutes regulatory agency concurrence of this IHSS Group as an NFAA. This information and NFAA determination will be documented in the FY03 Historical Release Report (HRR).

Table 1
PAC 900-175 – Characterization Sampling Specifications

IHSS Group	IHSS/PAC/UBC Site	Location Code	Easting	Northing	Media	Depth Interval	Analyte	Laboratory Method
900-4&5	IHSS 900-175, S&W Building 980 Contractor Storage Facility	CL43-002	2084965.91	750060.59	surface soil	A	metals radionuclides SVOCs nitrite/nitrate	6010 HPGe 8270 9056
		CK43-002	2084929.95	750062.37	surface soil	A	metals radionuclides SVOCs nitrite/nitrate	6010 HPGe 8270 9056
		CK43-001	2084894	750064.16	surface soil	A	metals radionuclides SVOCs nitrite/nitrate	6010 HPGe 8270 9056
		CL43-001	2084985.43	750090.83	surface soil	A	metals radionuclides SVOCs nitrite/nitrate	6010 HPGe 8270 9056
		CL43-000	2084949.48	750092.62	surface soil	A	metals radionuclides SVOCs nitrite/nitrate	6010 HPGe 8270 9056
		CK43-000	2084913.52	750094.40	surface soil	A	metals radionuclides SVOCs nitrite/nitrate	6010 HPGe 8270 9056

Table 2

PAC 900-175 - Surface Soil Greater than Background Mean Plus Two Standard Deviations or Reporting/Detection Limits

IHSS/PAC/ UBC Site	Location Code	Easting	Northing	Analyte	Depth Start (feet)	Depth End (feet)	Result	Reporting/ Detection Limit	Tier I Action Level	Tier II Action Level	Background Mean +2SD	Unit
900-175	CK43-000	2084949.95	750075.39	Benzo(a)anthracene	0	0.5	100	40	614000	6140	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Benzo(a)pyrene	0	0.5	140	97	61400	614	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Benzo(b)fluoranthene	0	0.5	130	100	614000	6140	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Benzo(k)fluoranthene	0	0.5	150	96	6140000	61400	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Bis(2-ethylhexyl)phthalate	0	0.5	82	71	32000000	320000	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Chromium	0	0.5	106	0.36	44300	4410	16.99	ug/kg
900-175	CK43-000	2084949.95	750075.39	Chrysene	0	0.5	150	55	61400000	614000	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Copper	0	0.5	31.9	0.19	71100	71100	18.06	ug/kg
900-175	CK43-000	2084949.95	750075.39	Fluoranthene	0	0.5	330	87	76800000	76800000	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Indeno(1,2,3-cd)pyrene	0	0.5	73	49	614000	6140	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Nickel	0	0.5	67.9	0.44	38400	38400	14.91	ug/kg
900-175	CK43-000	2084949.95	750075.39	Pyrene	0	0.5	290	41	57600000	57600000	NA	ug/kg
900-175	CK43-000	2084949.95	750075.39	Zinc	0	0.5	171	0.59	576000	576000	73.76	ug/kg
900-175	CK43-001	2084913.40	750094.41	Benzo(a)anthracene	0	0.5	180	41	614000	6140	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Benzo(a)pyrene	0	0.5	230	99	61400	614	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Benzo(b)fluoranthene	0	0.5	240	110	614000	6140	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Benzo(k)fluoranthene	0	0.5	230	98	6140000	61400	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Bis(2-ethylhexyl)phthalate	0	0.5	75	73	32000000	320000	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Chromium	0	0.5	40.3	0.35	44300	4410	16.99	ug/kg
900-175	CK43-001	2084913.40	750094.41	Chrysene	0	0.5	260	56	61400000	614000	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Copper	0	0.5	28.1	0.18	71100	71100	18.06	ug/kg
900-175	CK43-001	2084913.40	750094.41	Dimethyl phthalate	0	0.5	110	89	1000000000	1000000000	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Fluoranthene	0	0.5	550	88	76800000	76800000	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Indeno(1,2,3-cd)pyrene	0	0.5	150	50	614000	6140	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Nickel	0	0.5	30.5	0.43	38400	38400	14.91	ug/kg
900-175	CK43-001	2084913.40	750094.41	Pyrene	0	0.5	470	42	57600000	57600000	NA	ug/kg
900-175	CK43-001	2084913.40	750094.41	Zinc	0	0.5	96.9	0.57	576000	576000	73.76	ug/kg
900-175	CK43-002	2084894.08	750064.21	Benzo(a)anthracene	0	0.5	210	40	614000	6140	NA	ug/kg

Table 2

PAC 900-175 - Surface Soil Greater than Background Mean Plus Two Standard Deviations or Reporting/Detection Limits

IHSS/PAC/ UBC Site	Location Code	Easting	Northing	Analyte	Depth Start (feet)	Depth End (feet)	Result	Reporting/ Detection Limit	Tier I Action Level	Tier II Action Level	Background Mean +2SD	Unit
900-175	CK43-002	2084894.08	750064.21	Benzo(a)pyrene	0	0.5	240	96	61400	614	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Benzo(b)fluoranthene	0	0.5	230	100	614000	6140	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Benzo (K) Fluoranthene	0	0.5	240	95	6140000	61400	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Bis(2-ethylhexyl)phthalate	0	0.5	310	70	32000000	320000	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Chromium	0	0.5	102	0.36	44300	4410	16.99	mg/kg
900-175	CK43-002	2084894.08	750064.21	Chrysene	0	0.5	260	54	61400000	614000	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Copper	0	0.5	74.4	0.18	71100	71100	18.06	mg/kg
900-175	CK43-002	2084894.08	750064.21	Dibenz(a,h)anthracene	0	0.5	64	48	61400	614	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Dimethyl phthalate	0	0.5	320	86	1000000000	1000000000	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Fluoranthene	0	0.5	540	85	76800000	76800000	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Indeno(1,2,3-cd)pyrene	0	0.5	160	49	614000	6140	NA	ug/kg
900-175	CK43-002	2084894.08	750064.21	Nickel	0	0.5	69.3	0.44	38400	38400	14.91	mg/kg
900-175	CK43-002	2084894.078	750064.21	Pyrene	0	0.5	500	41	57600000	57600000	NA	ug/kg
900-175	CK43-002	2084894.078	750064.21	Zinc	0	0.5	172	0.58	576000	576000	73.76	mg/kg
900-175	CL43-000	2084913.25	750078.42	Benzo(a)anthracene	0	0.5	44	40	614000	6140	NA	ug/kg
900-175	CL43-000	2084913.25	750078.42	Bis(2-ethylhexyl)phthalate	0	0.5	9700	140	32000000	320000	NA	ug/kg
900-175	CL43-000	2084913.25	750078.42	Chromium	0	0.5	34.4	0.35	44300	4410	16.99	mg/kg
900-175	CL43-000	2084913.25	750078.42	Chrysene	0	0.5	58	54	61400000	614000	NA	ug/kg
900-175	CL43-000	2084913.25	750078.42	Copper	0	0.5	19.5	0.18	71100	71100	18.06	mg/kg
900-175	CL43-000	2084913.25	750078.42	Fluoranthene	0	0.5	120	86	76800000	76800000	NA	ug/kg
900-175	CL43-000	2084913.25	750078.42	Nickel	0	0.5	20.2	0.43	38400	38400	14.91	mg/kg
900-175	CL43-000	2084913.25	750078.42	Pyrene	0	0.5	100	41	57600000	57600000	NA	ug/kg
900-175	CL43-000	2084913.25	750078.42	Pyrene	0	0.5	100	82	57600000	57600000	NA	ug/kg
900-175	CL43-000	2084913.25	750078.42	Zinc	0	0.5	80.6	0.57	576000	576000	73.76	mg/kg
900-175	CL43-001	2084949.49	750092.67	Benzo(a)anthracene	0	0.5	310	39	614000	6140	NA	ug/kg
900-175	CL43-001	2084949.49	750092.67	Benzo(a)pyrene	0	0.5	270	95	61400	614	NA	ug/kg
900-175	CL43-001	2084949.49	750092.67	Benzo(b)fluoranthene	0	0.5	240	100	614000	6140	NA	ug/kg
900-175	CL43-001	2084949.49	750092.67	Benzo (K) Fluoranthene	0	0.5	290	94	6140000	61400	NA	ug/kg

Table 2

PAC 900-175 - Surface Soil Greater than Background Mean Plus Two Standard Deviations or Reporting/Detection Limits

IHSS/PAC/ UBC Site	Location Code	Easting	Northing	Analyte	Depth Start (feet)	Depth End (feet)	Result	Reporting/ Detection Limit	Tier I Action Level	Tier II Action Level	Background Mean +2SD	Unit
900-175	CL43-001	2084949.48	750092.62	Bis(2-ethylhexyl)phthalate	0	0.5	100	70	32000000	320000	NA	ug/kg
900-175	CL43-001	2084949.48	750092.62	Chromium	0	0.5	114	0.35	44300	4410	16.99	mg/kg
900-175	CL43-001	2084949.48	750092.62	Chrysene	0	0.5	390	54	61400000	614000	NA	ug/kg
900-175	CL43-001	2084949.48	750092.62	Copper	0	0.5	36.6	0.18	71100	71100	18.06	mg/kg
900-175	CL43-001	2084949.48	750092.62	Fluoranthene	0	0.5	690	85	76800000	76800000	NA	ug/kg
900-175	CL43-001	2084949.48	750092.62	Indeno(1,2,3-cd)pyrene	0	0.5	150	49	614000	6140	NA	ug/kg
900-175	CL43-001	2084949.48	750092.62	Iron	0	0.5	18900	1.6	5760000	576000	18037	mg/kg
900-175	CL43-001	2084949.48	750092.62	Lithium	0	0.5	11.6	0.24	38400	38400	11.55	mg/kg
900-175	CL43-001	2084949.48	750092.62	Nickel	0	0.5	69.7	0.43	38400	38400	14.91	mg/kg
900-175	CL43-001	2084949.48	750092.62	Pyrene	0	0.5	690	40	57600000	57600000	NA	ug/kg
900-175	CL43-001	2084949.48	750092.62	Zinc	0	0.5	80.5	0.58	5760000	5760000	73.76	mg/kg
900-175	CL43-002	2084985.46	750090.89	Benzo(a)anthracene	0	0.5	160	41	614000	6140	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Benzo(a)pyrene	0	0.5	190	98	614000	614	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Benzo(b)fluoranthene	0	0.5	170	100	614000	6140	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Benzo (K) Fluoranthene	0	0.5	200	97	6140000	61400	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Bis(2-ethylhexyl)phthalate	0	0.5	1600	71	32000000	320000	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Chromium	0	0.5	28.2	0.36	44300	4410	16.99	mg/kg
900-175	CL43-002	2084985.46	750090.89	Chrysene	0	0.5	210	55	61400000	614000	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Copper	0	0.5	31.5	0.19	71100	71100	18.06	mg/kg
900-175	CL43-002	2084985.46	750090.89	Fluoranthene	0	0.5	440	87	76800000	76800000	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Indeno(1,2,3-cd)pyrene	0	0.5	110	50	614000	6140	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Lithium	0	0.5	11.8	0.25	38400	38400	11.55	mg/kg
900-175	CL43-002	2084985.46	750090.89	Nickel	0	0.5	23.8	0.45	38400	38400	14.91	mg/kg
900-175	CL43-002	2084985.46	750090.89	Pyrene	0	0.5	450	42	57600000	57600000	NA	ug/kg
900-175	CL43-002	2084985.46	750090.89	Strontium	0	0.5	63.2	0.016	1000000	1000000	48.94	mg/kg

NA = not available

SD = standard deviation

Table 3
PAC 900-175 - Summary of Analytical Results

Analyte	Total Count	Detection Frequency (percent)	Average Result	Maximum Result	Background Mean+2SD	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Unit
1,2,4-Trichlorobenzene	7	0.00	387.14	670	NA	9230000	—	UG/KG
1,2-Dichlorobenzene	7	0.00	387.14	670	NA	31200000	—	UG/KG
1,4-Dichlorobenzene	7	0.00	387.14	670	NA	840000	—	UG/KG
2,4,5-Trichlorophenol	7	0.00	387.14	670	NA	102000000	—	UG/KG
2,4,6-Trichlorophenol	7	0.00	387.14	670	NA	3470000	—	UG/KG
2,4-Dichlorophenol	7	0.00	387.14	670	NA	3070000	—	UG/KG
2,4-Dimethylphenol	7	0.00	387.14	670	NA	20400000	—	UG/KG
2,4-Dinitrophenol	7	0.00	1871.43	3300	NA	2040000	—	UG/KG
2,4-Dinitrotoluene	7	0.00	387.14	670	NA	56300	—	UG/KG
2,6-Dinitrotoluene	7	0.00	387.14	670	NA	56300	—	UG/KG
2-Chloronaphthalene	7	0.00	387.14	670	NA	81800000	—	UG/KG
2-Chlorophenol	7	0.00	387.14	670	NA	5110000	—	UG/KG
2-Methylnaphthalene	7	0.00	387.14	670	NA	20400000	—	UG/KG
2-Methylphenol	7	0.00	387.14	670	NA	369000000	—	UG/KG
2-Nitroaniline	7	0.00	1871.43	3300	NA	167000000	—	UG/KG
3,3'-Dichlorobenzidine	7	0.00	1514.29	2600	NA	61300	—	UG/KG
3-Nitroaniline	7	0.00	1871.43	3300	NA	—	—	UG/KG
4,6-Dinitro-2-Methylphenol	7	0.00	1871.43	3300	NA	1020000	—	UG/KG
4-Bromophenyl Phenyl Ether	7	0.00	387.14	670	NA	—	—	UG/KG
4-Chloro-3-Methylphenol	7	0.00	387.14	670	NA	—	—	UG/KG
4-Chloroaniline	7	0.00	387.14	670	NA	2950000	—	UG/KG
4-Chlorophenyl-Phenyl Ether	7	0.00	387.14	670	NA	—	—	UG/KG
4-Methylphenol	7	0.00	387.14	670	NA	3690000	—	UG/KG
4-Nitrophenol	7	0.00	1871.43	3300	NA	8180000	—	UG/KG
Actinium-228	8	100.00	1.60	2.28	NA	—	—	PCI/G
Acenaphthene	7	0.00	387.14	670	NA	40800000	—	UG/KG
Acenaphthylene	7	0.00	387.14	670	NA	—	—	UG/KG

Table 3
PAC 900-175 - Summary of Analytical Results

Analyte	Total Count	Detection Frequency (percent)	Average Result	Maximum Result	Background Mean+2SD	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Unit
Aluminum	6	0.00	11291.67	14600	16902.00	228000	—	MG/KG
Americium-241	8	0.00	0.96	1.23	0.02	76	1900	PCI/G
Anthracene	7	0.00	387.14	670	NA	204000000	—	UG/KG
Antimony	6	50.00	1.48	3.9	NA	409	—	MG/KG
Arsenic	6	0.00	3.70	4.6	10.09	22.2	21.6	MG/KG
Barium	6	0.00	82.88	95.7	141.26	26400	—	MG/KG
Benzo(a)anthracene	7	85.71	239.14	670	NA	34900	800000	UG/KG
Benzo(a)pyrene	7	71.43	297.14	670	NA	3490	25700	UG/KG
Benzo(b)fluoranthene	7	71.43	288.57	670	NA	34900	1010000	UG/KG
Benzo(g,h,i)perylene	7	71.43	249.43	670	NA	—	—	UG/KG
Benzo(k)fluoranthene	7	71.43	302.86	670	NA	349000	1010000	UG/KG
Benzoic Acid	7	0.00	1871.43	3300	NA	1000000000	—	UG/KG
Benzyl Alcohol	7	0.00	387.14	670	NA	307000000	—	UG/KG
Beryllium	6	0.00	0.38	0.46	0.97	921	2.15	MG/KG
Bismuth-212	8	75.00	1.48	2.31	NA	—	—	PCI/G
Bismuth-214	8	100.00	0.65	1	NA	—	—	PCI/G
Bis(2-Chloroethoxy) Methane	7	0.00	387.14	670	NA	—	—	UG/KG
Bis(2-Chloroethyl) Ether	7	0.00	387.14	670	NA	34800	—	UG/KG
Bis(2-Chloroisopropyl) Ether	7	0.00	387.14	670	NA	547000	—	UG/KG
Bis(2-Ethylhexyl) Phthalate	7	100.00	2548.14	9700	NA	1970000	—	UG/KG
Boron	6	83.33	2.22	4.6	NA	—	—	MG/KG
Butylbenzylphthalate	7	0.00	387.14	670	NA	147000000	—	UG/KG
Cadmium	6	0.00	0.27	0.85	1.61	962	—	MG/KG
Calcium	6	50.00	18968.33	47300	4467.00	—	—	MG/KG
Chromium VI	6	100.00	70.82	114	16.99	268	—	MG/KG
Chrysene	7	85.71	285.43	670	NA	3490000	—	UG/KG
Cobalt	6	0.00	4.60	5.8	10.91	1550	—	MG/KG
Copper	6	100.00	37.00	74.4	18.06	40900	—	MG/KG

Table 3
PAC 900-175 - Summary of Analytical Results

Analyte	Total Count	Detection Frequency (percent)	Average Result	Maximum Result	Background Mean+2SD	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Unit
Cesium-137	8	0.00	0.09	0.12	1.68	—	—	PCI/G
Dibenz(a,h)anthracene	7	14.29	347.71	670	NA	3490	—	UG/KG
Dibenzofuran	7	0.00	387.14	670	NA	2950000	—	UG/KG
Diethylphthalate	7	0.00	767.14	1300	NA	5900000000	—	UG/KG
Dimethylphthalate	7	28.57	350.00	670	NA	1000000000	—	UG/KG
Di-n-butylphthalate	7	14.29	357.14	670	NA	73700000	—	UG/KG
Di-n-octylphthalate	7	0.00	387.14	670	NA	14700000	—	UG/KG
Fluoranthene	7	85.71	477.14	690	NA	27200000	—	UG/KG
Fluorene	7	0.00	387.14	670	NA	40800000	—	UG/KG
Hexachlorobenzene	7	0.00	387.14	670	NA	17200	—	UG/KG
Hexachlorobutadiene	7	0.00	387.14	670	NA	147000	—	UG/KG
Hexachlorocyclopentadiene	7	0.00	767.14	1300	NA	3500000	—	UG/KG
Hexachloroethane	7	0.00	387.14	670	NA	737000	1990000	UG/KG
Indeno(1,2,3-cd)pyrene	7	71.43	236.14	670	NA	34900	—	UG/KG
Iron	6	16.67	15600.00	18900	18037.00	307000	—	MG/KG
Isophorone	7	0.00	387.14	670	NA	29100000	—	UG/KG
Potassium-40	8	100.00	22.35	29	NA	—	—	PCI/G
Lead	6	0.00	26.63	40.2	54.62	1000	25.6	MG/KG
Lithium	6	16.67	10.22	11.6	11.55	20400	—	MG/KG
Magnesium	6	16.67	2540.00	3000	2849.30	—	—	MG/KG
Manganese	6	0.00	184.50	269	365.08	3480	—	MG/KG
m-Dichlorobenzene	7	0.00	387.14	670	NA	—	—	UG/KG
Mercury	6	0.00	0.02	0.04	0.13	25200	—	MG/KG
Molybdenum	6	100.00	1.63	2.4	NA	5110	—	MG/KG
Naphthalene	7	0.00	387.14	670	NA	3090000	—	UG/KG
Nickel	6	100.00	46.90	69.7	14.91	20400	—	MG/KG
Nitrate	6	100.00	3.62	11.1	NA	1000000	—	MG/KG
Nitrite	6	83.33	2.00	5.1	NA	102000	—	MG/KG

Table 3
PAC 900-175 - Summary of Analytical Results

Analyte	Total Count	Detection Frequency (percent)	Average Result	Maximum Result	Background Mean+2SD	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Unit
Nitrobenzene	7	0.00	387.14	670	NA	332000	—	UG/KG
N-Nitrosodiphenylamine	7	0.00	387.14	670	NA	7810000	—	UG/KG
N-Nitrosodipropylamine	7	0.00	387.14	670	NA	5470	—	UG/KG
O-Nitrophenol	7	0.00	387.14	670	NA	—	—	UG/KG
Protactinium-234	8	0.00	0.35	0.44	NA	—	—	PCI/G
Protactinium-234m	8	0.00	9.33	13	NA	—	—	PCI/G
Lead-212	8	100.00	1.52	2.03	NA	—	—	PCI/G
Lead-214	8	100.00	0.72	0.90	NA	—	—	PCI/G
Pentachlorophenol	7	0.00	1871.43	3300	NA	162000	—	UG/KG
Phenanthrene	7	85.71	258.57	670	NA	—	—	UG/KG
Phenanthrene, 1-Methyl-	1	0.00	550.00	550	NA	—	—	UG/KG
Phenol	7	0.00	387.14	670	NA	613000000	—	UG/KG
Plutonium-239/340	8	0.00	10.99	13.18	0.07	50	3800	PCI/G
P-Nitroaniline	7	0.00	1871.43	3300	NA	—	—	UG/KG
Polonium-210	8	0.00	7571.75	8780	NA	—	—	PCI/G
Potassium	6	0.00	2436.67	2760	2967.20	—	—	MG/KG
Pyrene	7	100.00	371.43	690	NA	221000000	—	UG/KG
Radium-226	8	50.00	2.44	3.64	0.93	—	—	PCI/G
Selenium	6	0.00	0.46	0.66	1.22	5110	—	MG/KG
Silica As SiO ₂ , Dissolved	6	100.00	405.83	460	NA	—	—	MG/KG
Silver	6	0.00	0.07	0.07	NA	5110	—	MG/KG
Sodium	6	0.00	152.67	156	91.84	—	—	MG/KG
Strontium	6	16.67	30.12	51.4	48.94	613000	—	MG/KG
Thorium-230	8	0.00	58.29	73.2	NA	—	—	PCI/G
Thorium-231	8	0.00	1.69	2.4	NA	—	—	PCI/G
Thallium	6	66.67	0.69	0.93	NA	—	—	MG/KG
Tin	6	100.00	1.70	2.3	NA	613000	—	MG/KG
Titanium	6	100.00	235.92	342	NA	—	—	MG/KG

Table 3
PAC 900-175 - Summary of Analytical Results

Analyte	Total Count	Detection Frequency (percent)	Average Result	Maximum Result	Background Mean+2SD	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Unit
Thallium-208	8	100.00	0.54	0.70	NA	—	—	PCI/G
Uranium (total)	6	0.00	5.70	5.8	NA	—	—	MG/KG
Uranium-235	8	25.00	0.15	0.22	0.09	8	1900	PCI/G
Uranium-238	8	37.50	2.03	3.57	2.00	351	1600	PCI/G
Vanadium	6	0.00	27.03	30.4	45.59	7150	433	MG/KG
Zinc	6	83.33	111.12	172	73.76	307000	—	MG/KG

SD = standard deviation

NA = not available

3.0 DEVIATIONS FROM PLANNED SAMPLING SPECIFICATIONS

Deviations from the planned sampling specifications described in IASAP Addendum #IA-02-02 (DOE 2002a) are presented in the following table.

Table 4
PAC 900-175 - Deviations from Planned Sampling Specifications

Sampling Location Code	Planned Easting	Planned Northing	Actual Easting	Actual Northing	Comments
CL43-0002	2084965.91	750060.59	2084985.46	750090.89	All sample location deviations resulted from utilities, structures, or auger refusal.
CK43-0002	2084929.95	750062.37	2084894.08	750064.21	
CL43-0001	2084985.43	750090.83	2084949.48	750092.62	
CL43-0000	2084949.48	750092.62	2084913.24	750078.42	
CK43-0000	2084913.52	750094.40	2084949.95	750075.39	

4.0 DATA QUALITY ASSESSMENT

The Data Quality Objectives (DQOs) for this project, as defined in the IASAP (DOE 2001), were achieved based on the Data Quality Assessment (DQA) provided in the following sections. The DQO/DQA process ensures that the type, quantity, and quality of environmental data used in decision making are defensible, with emphasis on attaining adequate (statistical) confidence in the decisions. The DQO/DQA process is based on the following guidance and requirements:

- EPA QA/G-4, 1994a, Guidance for the Data Quality Objective Process;
- EPA QA/G-9, 1998, Guidance for the Data Quality Assessment Process; Practical Methods for Data Analysis; and
- DOE Order 414.1A, 1999, Quality Assurance.

4.1.1 Data Quality Assessment Process

The DQA process ensures the type, quantity, and quality of environmental data used in decision making are defensible. Results are compared to method requirements and project goals. The results of these comparisons are summarized for RFCA COCs where the result could impact project decisions. Particular attention is paid to those values near ALs when quality control (QC) results could indicate unacceptable levels of uncertainty for decision-making purposes. The DQA process is based on the following guidance and requirements:

- EPA QA/G-4, 1994a, Guidance for the Data Quality Objective Process;
- EPA QA/G-9, 1998, Guidance for the Data Quality Assessment Process; Practical Methods for Data Analysis; and
- DOE Order 414.1A, 1999, Quality Assurance.

Verification and validation (V&V) of the data are the primary components of the DQA. The final data are compared with original project DQOs and evaluated with respect to project decisions; uncertainty within the decisions; and quality criteria required for the data, specifically precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS). Validation criteria are consistent with the following RFETS-specific documents and industry guidelines:

- EPA 540/R-94/012, 1994b, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review;
- EPA 540/R-94/013, 1994c, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review; and
- Kaiser-Hill Company, L.L.C.(K-H) V&V Guidelines:

- General Guidelines for Data Verification and Validation, DA-GR01-v2, 2002a.
 - V&V Guidelines for Isotopic Determinations by Alpha Spectrometry, DA-RC01-v2, 2002b.
 - V&V Guidelines for Volatile Organics, DA-SS01-v3, 2002c.
 - V&V Guidelines for Semivolatile Organics, DA-SS02-v3, 2002d.
 - V&V Guidelines for Metals, DA-SS05-v3, 2002e.
- Lockheed-Martin, 1997, Evaluation of Radiochemical Data Usability, ES/ER/MS-5.

This report will be submitted to the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA) Administrative Record (AR) for permanent storage 30 days after being provided to the Colorado Department of Public Health and Environmental (CDPHE) and/or the U.S. Environmental Protection Agency (EPA).

4.1.2 Verification and Validation of Results

Verification ensures that data produced and used by the project are documented and traceable in accordance with quality requirements. Validation consists of a technical review of all data that directly support the project decisions so that any limitations of the data relative to project goals are delineated and the associated data are qualified accordingly. The V&V process defines the criteria that constitute data quality, namely PARCCS parameters. Data traceability and archival are also addressed. V&V criteria include the following:

- Chain-of-custody;
- Preservation and hold-times;
- Instrument calibrations;
- Preparation blanks;
- Interference check samples (metals);
- Matrix spikes/matrix spike duplicates (MS/MSD);
- Laboratory control samples (LCS);
- Field duplicate measurements;
- Chemical yield (radiochemistry);
- Required quantitation limits/minimum detectable activities (sensitivity of chemical and radiochemical measurements, respectively); and
- Sample analysis and preparation methods.

Evaluation of V&V criteria ensures that PARCCS parameters are satisfactory (i.e., within tolerances acceptable to the project). Satisfactory V&V of laboratory quality controls are

captured through application of validation "flags" or qualifiers to individual records. Validation results are summarized in the "Completeness" subsection.

Field sampling was conducted according to the approved IASAP, including related SOPs and addenda. Raw hardcopy data (e.g., individual analytical data packages) are currently filed by RIN and are maintained by Kaiser-Hill Analytical Services Division (K-H ASD); older hardcopies may reside in the Federal Center in Lakewood, Colorado. Electronic data are stored in the RFETS Soil and Water Database (SWD).

Both real and QC data, as of June 11, 2003 are included on the enclosed compact disc (CD).

4.1.3 Accuracy

The following measures of accuracy were evaluated:

- Laboratory Control Sample Evaluation;
- Surrogate Evaluation;
- Field Blanks; and
- Sample Matrix Spike Evaluation.

Laboratory Control Sample Evaluation

The frequency of LCS measurements, relative to each laboratory batch, is given in Table 5. LCS frequency was adequate based on at least one LCS per batch. The minimum and maximum LCS results are also tabulated, by chemical, for the project. While not all LCS results are within tolerances, project decisions based on AL exceedances were not affected. Any qualifications of results due to LCS performance exceeding upper or lower tolerance limits are captured in the V&V flags, described in the Completeness Section.

Table 5
Laboratory Control Sample Evaluation

CAS Number	Analyte	Result Type	Minimum	Maximum	Number of Laboratory Samples	Number of Laboratory Batches	Unit	Test Method
120-82-1	1,2,4-TRICHLOROBENZENE	LC	68	76	2	2	%REC	SW-846 8270B
121-14-2	2,4-DINITROTOLUENE	LC	75	85	2	2	%REC	SW-846 8270B
95-57-8	2-CHLOROPHENOL	LC	70	73	2	2	%REC	SW-846 8270B
83-32-9	ACENAPHTHENE	LC	69	74	2	2	%REC	SW-846 8270B
7429-90-5	ALUMINUM	LC	92	94	2	2	%REC	SW-846 6010/6010B
7440-36-0	ANTIMONY	LC	88	90	2	2	%REC	SW-846 6010/6010B
7440-38-2	ARSENIC	LC	91	92	2	2	%REC	SW-846 6010/6010B
7440-39-3	BARIUM	LC	93	95	2	2	%REC	SW-846 6010/6010B
7440-41-7	BERYLLIUM	LC	90	90	2	2	%REC	SW-846 6010/6010B
7440-43-9	CADMIUM	LC	91	93	2	2	%REC	SW-846 6010/6010B
7440-48-4	COBALT	LC	88	90	2	2	%REC	SW-846 6010/6010B
7440-50-8	COPPER	LC	90	91	2	2	%REC	SW-846 6010/6010B
7439-89-6	IRON	LC	97	100	2	2	%REC	SW-846 6010/6010B
7439-92-1	LEAD	LC	90	93	2	2	%REC	SW-846 6010/6010B
7439-93-2	LITHIUM	LC	95	100	2	2	%REC	SW-846 6010/6010B
7439-96-5	MANGANESE	LC	91	93	2	2	%REC	SW-846 6010/6010B
7439-97-6	MERCURY	LC	93	93	1	1	%REC	SW-846 6010/6010B
7439-98-7	MOLYBDENUM	LC	87	90	2	2	%REC	SW-846 6010/6010B
7440-02-0	NICKEL	LC	91	93	2	2	%REC	SW-846 6010/6010B
14797-55-8	NITRATE AS N	LC	94	95	2	2	%REC	SW9056 OR E300.0 PREP E300.0
14797-65-0	NITRITE AS N	LC	96	96	2	2	%REC	SW9056 OR E300.0 PREP E300.0
621-64-7	N-NITROSO-DI-N-PROPYLAMINE	LC	70	72	2	2	%REC	SW-846 8270B

Table 5
Laboratory Control Sample Evaluation

CAS Number	Analyte	Result Type	Minimum	Maximum	Number of Laboratory Samples	Number of Laboratory Batches	Unit	Test Method
106-46-7	P-DICHLOROBENZENE	LC	68	73	2	2	%REC	SW-846 8270B
87-86-5	PENTACHLOROPHENOL	LC	66	70	2	2	%REC	SW-846 8270B
108-95-2	PHENOL	LC	70	75	2	2	%REC	SW-846 8270B
100-02-7	P-NITROPHENOL	LC	62	66	2	2	%REC	SW-846 8270B
129-00-0	PYRENE	LC	63	72	2	2	%REC	SW-846 8270B
7782-49-2	SELENIUM	LC	89	93	2	2	%REC	SW-846 6010/6010B
7440-22-4	SILVER	LC	92	93	2	2	%REC	SW-846 6010/6010B
7440-24-6	STRONTIUM	LC	92	94	2	2	%REC	SW-846 6010/6010B
7440-31-5	TIN	LC	88	89	2	2	%REC	SW-846 6010/6010B
7440-62-2	VANADIUM	LC	90	91	2	2	%REC	SW-846 6010/6010B
7440-66-6	ZINC	LC	90	95	2	2	%REC	SW-846 6010/6010B

Table 6
Surrogate Recovery Summary

VOC Surrogate Recoveries				
Number of Samples	Analyte	Minimum	Maximum	Unit Code
2	1,2-DICHLOROETHANE-D4	90	94	%REC
2	4-BROMOFLUOROBENZENE	94	95	%REC
2	TOLUENE-D8	95	95	%REC
SVOC Surrogate Recoveries				
Number of Samples	Analyte	Minimum	Maximum	Unit Code
12	TERPHENYL-D14	69	88	%REC
12	2-FLUOROBIPHENYL	65	83	%REC
12	2-FLUOROPHENOL	60	79	%REC
12	NITROBENZENE-D5	59	79	%REC

Surrogate Evaluation

The frequency of surrogate measurements, relative to each laboratory batch, is given in Table 6. Surrogate frequency was adequate based on at least one set per sample. The minimum and maximum surrogate results are tabulated by chemical for the entire project. Any qualifications of results due to surrogate results are captured in the V&V flags, described in the Completeness Section.

Field Blank Evaluation

Results of the field blank analyses are listed in Table 7. Detectable amounts of contaminants within field or laboratory blanks could indicate cross-contamination of samples. However, none of the chemicals detected in laboratory blanks were detected in real samples with concentrations exceeding ALs; therefore, no significant laboratory blank contamination is indicated. Field blanks were not collected for this project. Consequently, all detectable concentrations of arsenic and lead are considered present at the sampling locations, and not due to cross-contamination.

Table 7
Field Blank Summary

Sample QC Code	Test Method Name	Analyte	Maximum Detected Value	Unit
RB	GAMMA	Uranium-235	0.2	pCi/g
RB	GAMMA	Uranium-238	4	pCi/g
FB	SW8260B	Toluene	2	ug/L
RB	SW8260B	Toluene	0.3	ug/L
FB	SW8260B	2-Butanone	4	ug/L
FB	SW8260B	Naphthalene	0.8	ug/L
Field Blanks (Trip, Rinse, Field) results greater than detection limits (not *U* Qualified)				

Sample Matrix Spike Evaluation

The frequency of MS measurements, relative to each laboratory batch, was adequate based on at least one MS per batch. The minimum and maximum of MS results are summarized by chemical, for the entire project in Table 8. Although low recovery values may indicate negative bias for some analytes, recovery values alone do not result in rejection of results. Qualification of results because of out of tolerance spike recoveries is noted by electronic flagging of the results.

Table 8
Sample Matrix Spike Evaluation

CAS Number	Analyte	Result Type	Minimum	Maximum	Number of Laboratory Samples	Number of Laboratory Batches	Unit	Test Method
120-82-1	1,2,4-TRICHLOROBENZENE	MS	62	68	2	2	%REC	SW-846 8270B
121-14-2	2,4-DINITROTOLUENE	MS	70	85	2	2	%REC	SW-846 8270B
95-57-8	2-CHLOROPHENOL	MS	64	70	2	2	%REC	SW-846 8270B
83-32-9	ACENAPHTHENE	MS	64	75	2	2	%REC	SW-846 8270B
7429-90-5	ALUMINUM	MS	98	314	3	3	%REC	SW-846 6010/6010B
7440-36-0	ANTIMONY	MS	35	97	3	3	%REC	SW-846 6010/6010B
7440-38-2	ARSENIC	MS	91	97	3	3	%REC	SW-846 6010/6010B
7440-39-3	BARIUM	MS	102	103	3	3	%REC	SW-846 6010/6010B
7440-41-7	BERYLLIUM	MS	91	97	3	3	%REC	SW-846 6010/6010B
7440-43-9	CADMIUM	MS	90	100	3	3	%REC	SW-846 6010/6010B
7440-48-4	COBALT	MS	88	97	3	3	%REC	7440-48-4
7440-50-8	COPPER	MS	97	108	3	3	%REC	7440-50-8
7439-89-6	IRON	MS	102	672	3	3	%REC	7439-89-6
7439-92-1	LEAD	MS	94	99	3	3	%REC	7439-92-1
7439-93-2	LITHIUM	MS	100	105	3	3	%REC	7439-93-2
7439-96-5	MANGANESE	MS	98	100	3	3	%REC	7439-96-5
7439-97-6	MERCURY	MS	48	48	1	1	%REC	7439-97-6
7439-98-7	MOLYBDENUM	MS	83	98	3	3	%REC	7439-98-7
7440-02-0	NICKEL	MS	98	117	3	3	%REC	7440-02-0
14797-55-8	NITRATE AS N	MS	94	94	1	1	%REC	14797-55-8
14797-55-8	NITRATE AS N	MS	89	89	1	1	%REC	14797-55-8
14797-65-0	NITRITE AS N	MS	100	100	1	1	%REC	14797-65-0
14797-65-0	NITRITE AS N	MS	91	91	1	1	%REC	14797-65-0
621-64-7	N-NITROSO-DI-N-PROPYLAMINE	MS	63	67	2	2	%REC	621-64-7
106-46-7	P-DICHLOROBENZENE	MS	60	65	2	2	%REC	106-46-7
87-86-5	PENTACHLOROPHENOL	MS	52	52	2	2	%REC	87-86-5
108-95-2	PHENOL	MS	64	71	2	2	%REC	108-95-2
100-02-7	P-NITROPHENOL	MS	60	61	2	2	%REC	100-02-7
129-00-0	PYRENE	MS	65	76	2	2	%REC	129-00-0
7782-49-2	SELENIUM	MS	90	96	3	3	%REC	7782-49-2
7440-22-4	SILVER	MS	90	102	3	3	%REC	7440-22-4
7440-24-6	STRONTIUM	MS	99	101	3	3	%REC	7440-24-6
7440-31-5	TIN	MS	85	97	3	3	%REC	7440-31-5
7440-62-2	VANADIUM	MS	100	121	3	3	%REC	7440-62-2
7440-66-6	ZINC	MS	78	98	3	3	%REC	7440-66-6

4.1.4 Precision

Matrix Spike Duplicate Evaluation

Laboratory precision is measured through use of MSD. Adequate frequency of MSD measurements is indicated by at least one MSD in each laboratory batch. Although some RPD values, listed in Table 9, exceed the maximum target of 35 percent, all sample results were repeatable at concentrations well below their respective ALs.

Table 9
Sample Matrix Spike Duplicate Evaluation

Analyte Name	Number of Sample Pairs	Number of Laboratory Batches	Max RPD (percent)
1,2,4-TRICHLOROBENZENE	2	2	8
2,4-DINITROTOLUENE	2	2	8
2-CHLOROPHENOL	2	2	8
ACENAPHTHENE	2	2	5
ALUMINUM	3	3	3
ANTIMONY	3	3	1
ARSENIC	3	3	7
BARIUM	3	3	9
BERYLLIUM	3	3	6
CADMIUM	3	3	6
CADMIUM	3	3	6
COBALT	3	3	7
COPPER	3	3	25
IRON	3	3	98
LEAD	3	3	121
LITHIUM	3	3	7
MANGANESE	3	3	43
MERCURY	1	1	33
MOLYBDENUM	3	3	6
NICKEL	3	3	75
NITRATE AS N	1	1	1
NITRATE AS N	1	1	5
NITRITE AS N	1	1	1
NITRITE AS N	1	1	4
N-NITROSO-DI-N-PROPYLAMINE	2	2	9
P-DICHLOROBENZENE	2	2	7
PENTACHLOROPHENOL	2	2	7
PHENOL	2	2	11
P-NITROPHENOL	2	2	5
PYRENE	2	2	3
SELENIUM	3	3	5
SILVER	3	3	7
STRONTIUM	3	3	11
TIN	3	3	6
VANADIUM	3	3	10
ZINC	3	3	12

Field Duplicate Evaluation

Field duplicate results reflect sampling precision or overall repeatability of the sampling process. The frequency of field duplicate collection should exceed 1 field duplicate per 20 real samples, or 5 percent. Data in Table 10 indicates that duplicate sampling frequencies were adequate for all suites except radionuclides.

A common metric for evaluating precision is the relative percent difference (RPD) value; RPD values are given in Table 11. Ideally, RPDs of less than 35 percent (in soil) indicate satisfactory precision. If contaminant concentrations exceeded ALs and the 35% RPD value, then associated results were reviewed to determine if the magnitude of imprecision could impact decisions (i.e., could sample concentrations measured below ALs exceed AL?).

Table 10
Field Duplicate Sample Frequency

Test Method Name	Sample Code	Number of Samples	Percent of Duplicate Samples
GAMMA SPECTROSCOPY	REAL	6	0
SW-846 6010/6010B	REAL	6	17
SW-846 6010/6010B	DUP	1	
SW-846 8270B	REAL	6	17
SW-846 8270B	DUP	1	
SW9056 OR E300.0 PREP E300.0	REAL	6	17
SW9056 OR E300.0 PREP E300.0	DUP	1	

Table 11
RPD Evaluation

Analyte	Max of RPD (percent)
1,2,4-TRICHLOROBENZENE	0
2,4,5-TRICHLOROPHENOL	0
2,4,6-TRICHLOROPHENOL	0
2,4-DICHLOROPHENOL	0
2,4-DIMETHYLPHENOL	0
2,4-DINITROPHENOL	0
2,4-DINITROTOLUENE	0
2,6-DINITROTOLUENE	0
2-CHLORONAPHTHALENE	0
2-CHLOROPHENOL	0
2-NITROANILINE	0
4-CHLOROANILINE	0
ACENAPHTHENE	0
ALUMINUM	2
ANTHRACENE	0
ANTIMONY	26
ARSENIC	8
BARIUM	5
BENZO(A)ANTHRACENE	37
BENZO(A)PYRENE	24
BENZO(B)FLUORANTHENE	19
BENZO(K)FLUORANTHENE	42

Table 11
RPD Evaluation

Analyte	Max of RPD (percent)
BENZOIC ACID	0
BERYLLIUM	29
BIS(2-ETHYLHEXYL)PHTHALATE	162
BUTYLBENZYLPHTHALATE	0
CHRYSENE	33
COBALT	2
COPPER	49
DIBENZ(A,H)ANTHRACENE	0
DIBENZOFURAN	0
FLUORANTHENE	29
FLUORENE	0
HEXACHLOROBENZENE	0
HEXACHLOROBUTADIENE	0
HEXACHLOROCYCLOPENTADIENE	1
HEXACHLOROETHANE	0
INDENO(1,2,3-CD)PYRENE	20
IRON	17
ISOPHORONE	0
LEAD	57
LITHIUM	6
MANGANESE	4
MERCURY	30
MOLYBDENUM	108
NAPHTHALENE	0
NICKEL	3
NITROBENZENE	0
N-NITROSODIPHENYLAMINE	0
PENTACHLOROPHENOL	0
PHENOL	0
PYRENE	37
SELENIUM	2
SILVER	0
STRONTIUM	21
TIN	34
VANADIUM	3
ZINC	2

4.1.5 Completeness

Based on original project DQOs, a minimum of 25 percent of ER Program analytical (and radiological) results must be formally verified and validated. Of that percentage, no more than 10 percent of the results may be rejected, which ensures that analytical laboratory practices are consistent with quality requirements. Table 12 shows the number and percentage of validated records (codes without "1"), the number and percentage of verified records (codes with "1"), and the percentage of rejected records for each analyte group. The frequency of validation is within

project quality requirements for all suites except radionuclides. A check of hardcopy V&V records indicates that validation frequency is better than the minimum of 25 percent for both alpha and gamma spectroscopy, but the associated validation flags have not yet been uploaded to electronic records in the Soil Water Database (SWD). Following upload of the V&V flags to SWD, the validation frequency of electronic records will be acceptable.

The frequency of validation is in compliance with the RFETS validation goal of 25 percent of all analytical records indicating that these data are adequate.

Table 12
Validation and Verification Summary

Validation Code	Number of Records	Radionuclides	Metals	Inorganics
V&V	185	119	0	0
J	81	0	81	0
V	514	0	105	12
Total	780	119	186	12
Total Validated	595	0	186	12
Percent Validated	76%	0%	100%	100%
Total Verified	0%	0%	0%	0%
Percent Verified	0%	0%	0%	0%
Percent Rejected	0%	0%	0%	0%

KEY: 1, V1 - Verified
 J, J1 - Estimated
 UJ1 - Estimated detection limit
 V - Validated

4.1.6 Sensitivity

Reporting limits, in units of ug/kg for organics, mg/kg for metals, and pCi/g for radionuclides, were compared with RFCA WRW and Ecological Receptor ALs. Adequate sensitivities of analytical methods were attained for all COCs that affect project decisions. "Adequate" sensitivity is defined as a reporting limit less than an analyte's associated AL, typically less than one-half the AL.

4.1.7 Summary of Data Quality

The RPDs greater than 35 percent indicate that the sampling precision limits of some analytes have been exceeded. However, the imprecision does not affect project decisions because with the exception of lead exceeding the Ecological Receptor AL but below background, there were no AL exceedances and no records were rejected. Compliance with the project quality requirements and RFETS validation goal of 25 percent of all analytical records indicates that these data are adequate. If additional V&V information is received, IHSS Group 900-4&5 records will be updated in SWD. Data qualified as a result of additional data will be assessed as part of the Comprehensive Risk Assessment process.

Data collected and used for IHSS Group 900-4&5 are adequate for decision-making.

5.0 REFERENCES

- DOE, 1992-2001, Historical Release Reports for the Rocky Flats Plant, Rocky Flats Plant, Golden, Colorado.
- DOE, 1999, Order 414.1A, Quality Assurance.
- DOE, 2000, Rocky Flats Cleanup Agreement (RFCA), Attachment 5, March.
- DOE, 2001, Industrial Area Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, June.
- DOE, 2002a, Industrial Area Sampling and Analysis Plan Addendum #IA-02-02, Rocky Flats Environmental Technology Site, Golden, Colorado, January.
- DOE, 2002b, Environmental Restoration RFCA Standard Operating Protocol for Routine Soil Remediation, Rocky Flats Environmental Technology Site, Golden, Colorado, January.
- EPA QA/G-4, 1994a, Guidance for the Data Quality Objective Process.
- EPA 540/R-94/012, 1994b, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.
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- Kaiser-Hill (K-H), 2002a, General Guidelines for Data Verification and Validation, DA-GR01-v2, October.
- K-H, 2002b, V&V Guidelines for Isotopic Determinations by Alpha Spectrometry, DA-RC01-v2, October.
- K-H, 2002c, V&V Guidelines for Volatile Organics, DA-SS01-v3, October.
- K-H, 2002d, V&V Guidelines for Semivolatile Organics, DA-SS02-v3, October.
- K-H, 2003e, V&V Guidelines for Metals, DA-SS05-v3, October.
- Lockheed-Martin, 1997, Evaluation of Radiochemical Data Usability, ES/ER/MS-5.

APPENDIX A

**WILDLIFE REFUGE WORKER/ECOLOGICAL RECEPTOR ACTION LEVEL
COMPARISON TABLE**

Appendix A
Wildlife Refuge Worker/Ecological Receptor Action Level Comparison Table

Location	Analyte	Soil Begin Depth (feet)	Soil End Depth (feet)	Result	RL/DL	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Background Mean+2SD	Unit
CK43-000	Benzo(a)anthracene	0	0.5	100	40	34900	800,000	NA	ug/kg
CK43-000	Benzo(a)pyrene	0	0.5	140	97	3490	25,700	NA	ug/kg
CK43-000	Benzo(b)fluoranthene	0	0.5	130	100	34900	1,010,000	NA	ug/kg
CK43-000	Benzo(k)Fluoranthene	0	0.5	150	96	349000	1,010,000	NA	ug/kg
CK43-000	Bis(2-ethylhexyl)phthalate	0	0.5	82	71	1970000	—	NA	ug/kg
CK43-000	Chromium (total)	0	0.5	106	0.36	NA	—	16.99	mg/kg
CK43-000	Chrysene	0	0.5	150	55	3490000	—	NA	ug/kg
CK43-000	Copper	0	0.5	31.9	0.19	40900	—	18.06	mg/kg
CK43-000	Fluoranthene	0	0.5	330	87	27200000	—	NA	ug/kg
CK43-000	Indeno(1,2,3-cd)pyrene	0	0.5	73	49	34900	—	NA	ug/kg
CK43-000	Nickel	0	0.5	67.9	0.44	20400	—	14.91	mg/kg
CK43-000	Pyrene	0	0.5	290	41	22100000	—	NA	ug/kg
CK43-000	Zinc	0	0.5	171	0.59	307000	—	73.76	mg/kg
CK43-000	Benzo(a)anthracene	0	0.5	180	41	34900	800,000	NA	ug/kg
CK43-001	Benzo(a)pyrene	0	0.5	230	99	3490	25,700	NA	ug/kg
CK43-001	Benzo(b)fluoranthene	0	0.5	240	110	34900	1,010,000	NA	ug/kg
CK43-001	Benzo(k)Fluoranthene	0	0.5	230	98	349000	1,010,000	NA	ug/kg
CK43-001	Bis(2-ethylhexyl)phthalate	0	0.5	75	73	1970000	—	NA	ug/kg
CK43-001	Chromium (total)	0	0.5	40.3	0.35	NA	—	16.99	mg/kg
CK43-001	Chrysene	0	0.5	260	56	3490000	—	NA	ug/kg
CK43-001	Copper	0	0.5	28.1	0.18	40900	—	18.06	mg/kg
CK43-001	Dimethyl phthalate	0	0.5	110	89	1000000000	—	NA	ug/kg
CK43-001	Fluoranthene	0	0.5	550	88	27200000	—	NA	ug/kg
CK43-001	Indeno(1,2,3-cd)pyrene	0	0.5	150	50	34900	—	NA	ug/kg
CK43-001	Nickel	0	0.5	30.5	0.43	20400	—	14.91	mg/kg
CK43-001	Pyrene	0	0.5	470	42	22100000	—	NA	ug/kg
CK43-001	Zinc	0	0.5	96.9	0.57	307000	—	73.76	mg/kg
CK43-002	Benzo(a)anthracene	0	0.5	210	40	34900	800,000	NA	ug/kg









Appendix A
Wildlife Refuge Worker/Ecological Receptor Action Level Comparison Table

Location	Analyte	Soil Begin Depth (feet)	Soil End Depth (feet)	Result	RL/DL	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Background Mean+2SD	Unit
CK43-002	Benzo(a)pyrene	0	0.5	240	96	3490	25,700	NA	ug/kg
CK43-002	Benzo(b)fluoranthene	0	0.5	230	100	34900	1,010,000	NA	ug/kg
CK43-002	Benzo (K) Fluoranthene	0	0.5	240	95	349000	1,010,000	NA	ug/kg
CK43-002	Bis(2-ethylhexyl)phthalate	0	0.5	310	70	1970000	—	NA	ug/kg
CK43-002	Chromium (total)	0	0.5	102	0.36	NA	—	16.99	mg/kg
CK43-002	Chrysene	0	0.5	260	54	3490000	—	NA	ug/kg
CK43-002	Copper	0	0.5	74.4	0.18	40900	—	18.06	mg/kg
CK43-002	Dibenz(a,h)anthracene	0	0.5	64	48	3490	—	NA	ug/kg
CK43-002	Dimethyl phthalate	0	0.5	320	86	1000000000	—	NA	ug/kg
CK43-002	Fluoranthene	0	0.5	540	85	27200000	—	NA	ug/kg
CK43-002	Indeno(1,2,3-cd)pyrene	0	0.5	160	49	34900	—	NA	ug/kg
CK43-002	Nickel	0	0.5	69.3	0.44	20400	—	14.91	mg/kg
CK43-002	Pyrene	0	0.5	500	41	22100000	—	NA	ug/kg
CK43-002	Zinc	0	0.5	172	0.58	307000	—	73.76	mg/kg
CL43-000	Benzo(a)anthracene	0	0.5	44	40	34900	800,000	NA	ug/kg
CL43-000	Bis(2-ethylhexyl)phthalate	0	0.5	9700	140	1970000	—	NA	ug/kg
CL43-000	Chromium (total)	0	0.5	34.4	0.35	NA	—	16.99	mg/kg
CL43-000	Chrysene	0	0.5	58	54	3490000	—	NA	ug/kg
CL43-000	Copper	0	0.5	19.5	0.18	40900	—	18.06	mg/kg
CL43-000	Fluoranthene	0	0.5	120	86	27200000	—	NA	ug/kg
CL43-000	Nickel	0	0.5	20.2	0.43	20400	—	14.91	mg/kg
CL43-000	Pyrene	0	0.5	100	41	22100000	—	NA	ug/kg
CL43-000	Pyrene	0	0.5	100	82	22100000	—	NA	ug/kg
CL43-000	Zinc	0	0.5	80.6	0.57	307000	—	73.76	mg/kg
CL43-001	Benzo(a)anthracene	0	0.5	310	39	34900	800,000	NA	ug/kg
CL43-001	Benzo(a)pyrene	0	0.5	270	95	3490	25,700	NA	ug/kg
CL43-001	Benzo(b)fluoranthene	0	0.5	240	100	34900	1,010,000	NA	ug/kg
CL43-001	Benzo (K) Fluoranthene	0	0.5	290	94	349000	1,010,000	NA	ug/kg

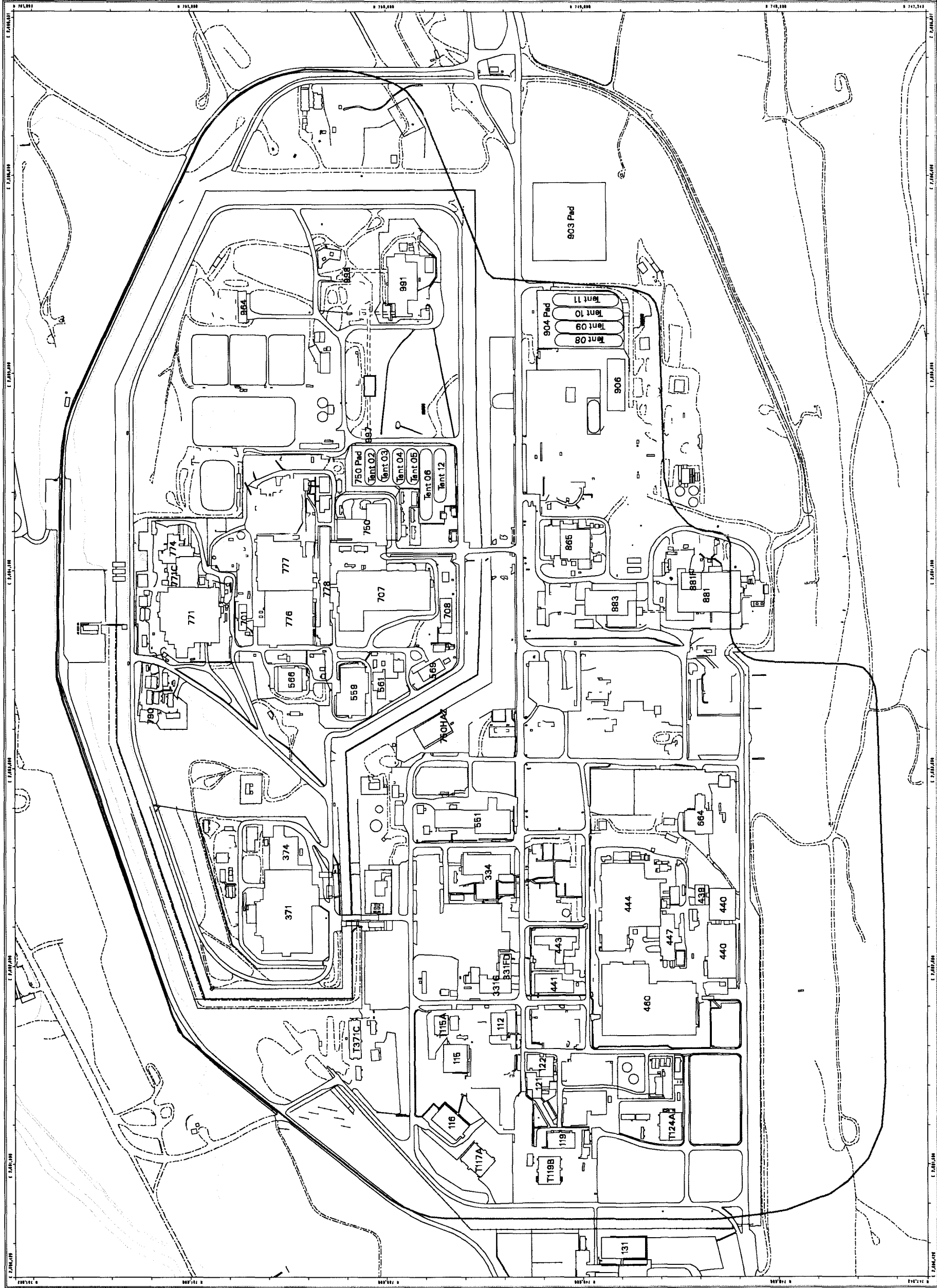
Appendix A
Wildlife Refuge Worker/Ecological Receptor Action Level Comparison Table

Location	Analyte	Soil Begin Depth (feet)	Soil End Depth (feet)	Result	RL/DL	Wildlife Refuge Worker Action Level	Ecological Receptor Action Level	Background Mean+2SD	Unit
CL43-001	Bis(2-ethylhexyl)phthalate	0	0.5	100	70	1970000	—	NA	ug/kg
CL43-001	Chromium (total)	0	0.5	114	0.35	NA	—	16.99	mg/kg
CL43-001	Chrysene	0	0.5	390	54	3490000	—	NA	ug/kg
CL43-001	Copper	0	0.5	36.6	0.18	40900	—	18.06	mg/kg
CL43-001	Fluoranthene	0	0.5	690	85	27200000	—	NA	ug/kg
CL43-001	Indeno(1,2,3-cd)pyrene	0	0.5	150	49	34900	—	NA	ug/kg
CL43-001	Iron	0	0.5	18900	1.6	307000	—	18037	mg/kg
CL43-001	Lithium	0	0.5	11.6	0.24	20400	—	11.55	mg/kg
CL43-001	Nickel	0	0.5	69.7	0.43	20400	—	14.91	mg/kg
CL43-001	Pyrene	0	0.5	690	40	22100000	—	NA	ug/kg
CL43-001	Zinc	0	0.5	80.5	0.58	307000	—	73.76	mg/kg
CL43-002	Benzo(a)anthracene	0	0.5	160	41	34900	800,000	NA	ug/kg
CL43-002	Benzo(a)pyrene	0	0.5	190	98	3490	25,700	NA	ug/kg
CL43-002	Benzo(b)fluoranthene	0	0.5	170	100	34900	1,010,000	NA	ug/kg
CL43-002	Benzo (K) Fluoranthene	0	0.5	200	97	349000	1,010,000	NA	ug/kg
CL43-002	Bis(2-ethylhexyl)phthalate	0	0.5	1600	71	1970000	—	NA	ug/kg
CL43-002	Chromium (total)	0	0.5	28.2	0.36	NA	—	16.99	mg/kg
CL43-002	Chrysene	0	0.5	210	55	3490000	—	NA	ug/kg
CL43-002	Copper	0	0.5	31.5	0.19	40900	—	18.06	mg/kg
CL43-002	Fluoranthene	0	0.5	440	87	27200000	—	NA	ug/kg
CL43-002	Indeno(1,2,3-cd)pyrene	0	0.5	110	50	34900	—	NA	ug/kg
CL43-002	Lithium	0	0.5	11.8	0.25	20400	—	11.55	mg/kg
CL43-002	Nickel	0	0.5	23.8	0.45	20400	—	14.91	mg/kg
CL43-002	Pyrene	0	0.5	450	42	22100000	—	NA	ug/kg
CL43-002	Strontium	0	0.5	63.2	0.016	613000	—	48.94	mg/kg

EXPLANATION
IHSS Groupings

- Standard Map Features**
-  Buildings and other structures
 -  Lakes and ponds
 -  Streams, ditches, or other drainage features
 -  Fences and other barriers
 -  Paved roads
 -  Dirt roads
 -  Solar Evaporation Ponds (SEPs)
 -  Industrial Area Operable Unit Boundary

DATA SOURCE BASE FEATURES:
PAICS
 Historical Release Report (HRR)
 2nd Annual Update
 Sept. 30, 1987
 Individual Hazardous Substance Sites (IHSS)
 DCE, TSC2, HRR Report and Subsequent Updates
 Buildings, fences, highway roads and other
 structures from 1956 aerial fly-over data
 captured by EGMG RSL, Las Vegas
 Digitized from the orthorectified graphs. 1/95



Scale = 1 : 6000
1 inch represents 500 feet

State Plane Coordinates Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-868-7707

Prepared for:



DynCorp
THE ART OF TECHNOLOGY

November 13, 2002

Figure 2
900-175 Surface Soil Results
Greater than Background Mean
Plus Two Standard Deviations
or Reporting/Detection Limits

KEY

- Surface Soil Location
- IHSS
- Solar Ponds
- Building

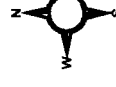
Original Process Waste Line

Paved Area

Dirt Road

Stream

Bdg ft = Soil Begin Depth Feet
End ft = Soil End Depth Feet
RI = Reporting/Detection Limit
M+2sd = Background Mean Plus
Two Standard Deviations



Scale = 1: 850

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: Date: April 2003

RADMS

Prepared for:



KAISER-HILL
COMPANY

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